To be completed by the Secretariat:

Document No.:	WG-SAM-14/12
Date submitted:	12 June 2014
Original Language:	English

To be completed by the author:

Meeting:	WG-SAM-14
Agenda Item No(s):	3

Title **Results of the Spanish exploratory longline fishery for *Dissostichus* spp. in Divisions 58.4.1 and 58.4.2 in the 2013/14 season**

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Published or accepted for publication elsewhere? Yes [ ] No [x]

If published or in press, give details:

To be considered for publication in *CCAMLR Science*?[1] Yes [ ] No [x]

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Abstract

Following the Spanish research plan approved by the SC-CCAMLR XXXII, during the second year of the multi-year research survey in Divisions 58.4.1 and 58.4.2, the F/V *Tronio* has returned to the same places surveyed in the 2012/13 season, as well as expanded the experience westwards to the 58.4.1D and 58.4.1C SSRUs.

A prospective estimation of the local biomass (B_{LOC}) of one localized area that was visited for the commercial Spanish fleet along five seasons in the SSRU 58.4.1C is made, together with the estimation of the total Biomass in the entire SSRU using a depletion model.

There have been some Antarctic toothfish recaptured that would allow, in successive years, to estimate the local abundance by tag-recapture models.

The IEO is starting the process of reading otoliths with ageing purposes, data to be added in order to carry out a robust assessment of *Dissostichus eleginoides* stock in these divisions.

Results of other data collected such as fish by-catch, incidental catch of benthic taxa or otoliths collection for ageing purposes are also presented.

RESULTS OF THE SPANISH EXPLORATORY LONGLINE FISHERY FOR *Dissostichus* spp. IN DIVISIONS 58.4.1 AND 58.4.2 IN THE 2013/14 SEASON.

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INTRODUCTION

Following the Spanish research plan approved by the SC-CCAMLR XXXII, during the second year of the multi-year research survey in Divisions 58.4.1 and 58.4.2, the F/V *Tronio* has returned to the same places visited in the 2012/13 season, as well as expanded the experience westwards to the 58.4.1D and 58.4.1C SSRUs.

During this season the research has started in the SSRUs 58.4.1D and C due to the large extent of ice cover in the SSRUs closest to the Ross Sea. The vessel returned to the 58.4.1H and G SSRUs at the end of the research cruise.

Five documents have been presented to the WG-FSA and WG-SAM in 2012 and 2013, namely WG-SAM-13/12, WG-SAM-13/30, WG-FSA-13/15, WG-FSA-12/69 and WG-SAM-12/13, describing the proposal and results according to the advice of the previous Working Groups meetings.

The vessel *Tronio* has started the research plan in February 2014, once finished the exploratory fishing season in the Subarea 88.1, using the Spanish bottom longline system. A total of 83 research sets were performed within the SSRUs 58.4.1H, 58.4.1G, 58.4.1D and 58.4.1C. Three depletion experiments were completed and six prospecting-phase clusters of sets did not reach the threshold to start the depletion.

A prospective estimation of the local biomass (B_{LOC}) of one localized area that was visited for the Spanish fleet along 5 seasons in the SSRU 58.4.1C is made, together with the estimation of the total Biomass in the entire SSRU, where the only successful depletion experiment of the three performed happened.

There have been recaptured three Antarctic toothfish (TOA) tagged the previous year in the SSRU 58.4.1H, as well as one recapture from another vessel of a TOA tagged in 2011 and two same season recaptures in the 58.4.1C.

Being a multi-year proposal, this analysis will be reviewed and completed the upcoming years with the new data obtained.

Results of other activities such as fish bycatch, benthic taxa incidental catch or otoliths collected for ageing purposes are also presented.

SUMMARY OF THE 2013/14 SEASON EXPERIENCE

The vessel arrived to the SSRU 58.4.1D on 21th January 2014 after finish the exploratory fishing in the subarea 88.1 and ended the 2nd stage of the research plan in the SSRU 58.4.1H on 18th February 2014.

As in the previous cruise, the experiment has been led by Juan Agulló, the Spanish scientific observer on board along with Zaytsev Oleksandr, International scientific observer from the YugNIRO, Ukraine. The experience was closely supervised by the research team from the *Centro Oceanográfico de Canarias* of the IEO in Spain, in permanent contact.

The survey protocol agreed with the recommendations proposed in the 2013 WG-SAM, WG-FSA and SC-CCAMLR (paragraph 2.29- SC-CCAMLR-XXXII) which updated the research plan described in Sarralde *et al.*, 2013(a) and (b) and the Spanish proposal for a scientific survey (CCAMLR, 2013). The highest priority has been to return to the previously visited locations, to evaluate CPUE variability between years and to recapture tagged fish.

A new prospection scheme has been made in order to conduct the survey across the whole range of depth, to inform improved area-based estimation of biomass within fishable depths at the SSRU scale. It was preview to conduct at least one cluster of sets in every polygon over shallower depths (550-800m). Rectangles in red show places where the depletion was made last year.

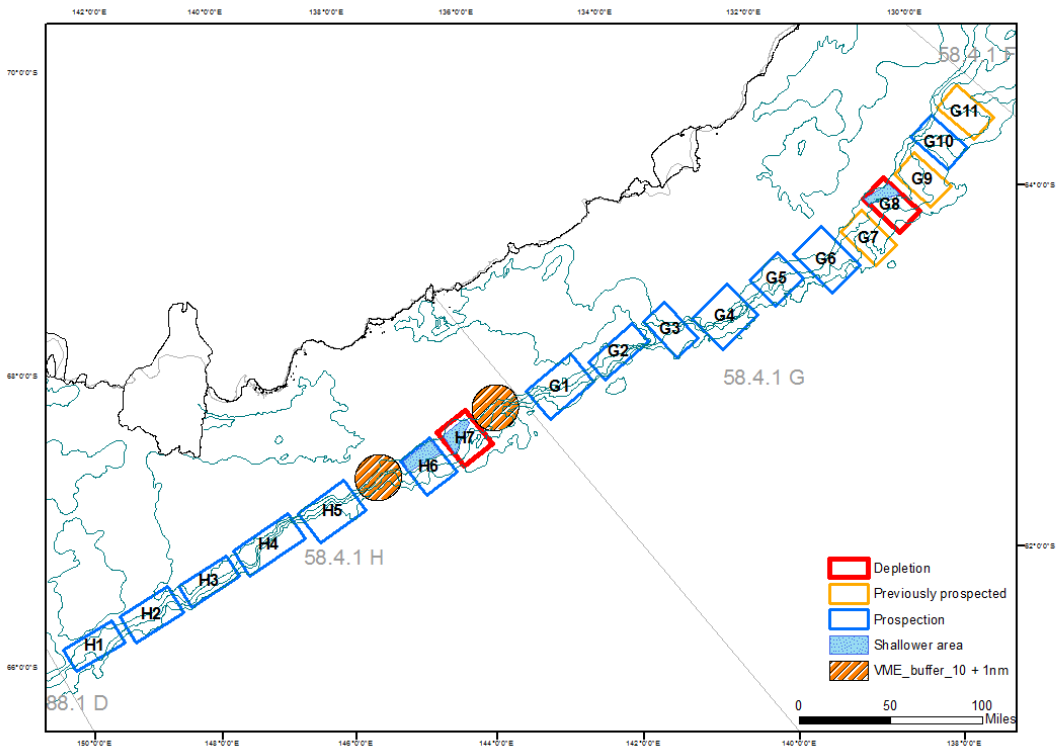


Figure 1. SSRUs 58.4.1H and 58.4.1G prospection scheme with the shallowed area highlighted.

The phase of prospection was performed in clusters of 4, 5 or 6 standardized sets. When the mean CPUE of the cluster was higher than 0.3 kg/hook (CV ≤ 30%), a minimum of 10 sets were carried out sequentially within a circle of approximately 10 nautical miles diameter, until partial depletion of the local population of *Dissostichus* spp. is observed, i.e. until the catch and effort index has dropped (at least 0.2 kg/hook from the first set) significantly ($\alpha = 0.05$).

Unfortunately the presence of ice has greatly influenced the normal development of the survey from the beginning, where it was intended to start in the SSRU 58.4.1H, and also the bad sea-ice condition prevented the setting into shallower bottoms. So, the vessel was forced to go westwards to find an area suitable to start the experiment. The survey started in the SSRU 58.4.1D (Figure 2) where 4 prospecting cluster of sets were made. Next, the vessel went to the 58.4.1C where it performed one prospection set and one depletion experiment. In the regression analysis made in the SSRU 58.4.1C, the two sets performed in the southern part of the depletion circle have not been used for the local abundance estimation.

After that the vessel headed to the 58.4.1G (Figure 3) where one prospection and one depletion experiment took place and finally one more depletion was conducted in the 58.4.1H SSRU, finishing the research survey.

In total, 83 research sets have been performed in nine clusters within four SSRUs. Three of them include a depletion experiment (clusters 1 to 3) and the six remaining clusters for prospection did not reach the threshold to start the depletion (0.3 kg/hook)

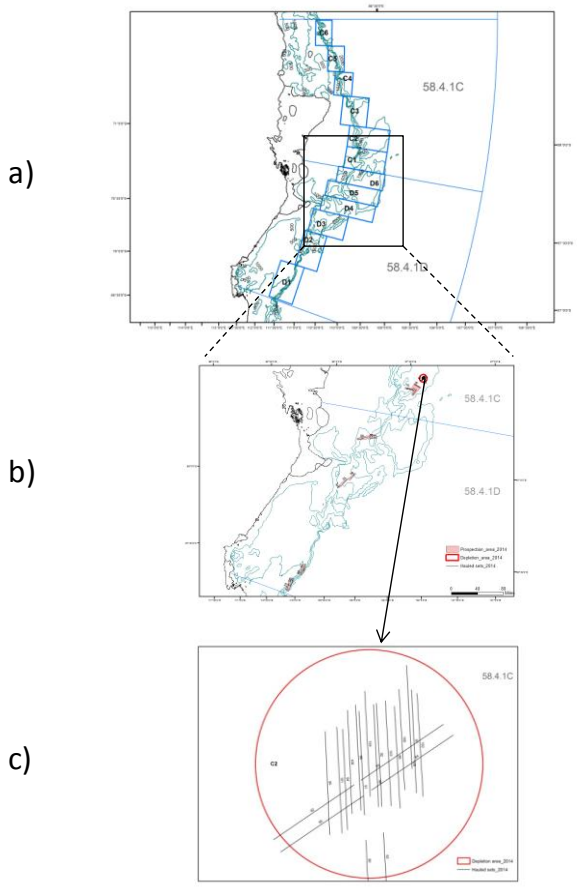


Figure 2. Design of the survey in the SSRUs 58.4.1C and D, prospection blocks (a); depletion and prospection area and sets hauled in 2014 (b); and detailed sequence of sets performed within the depletion area (c).

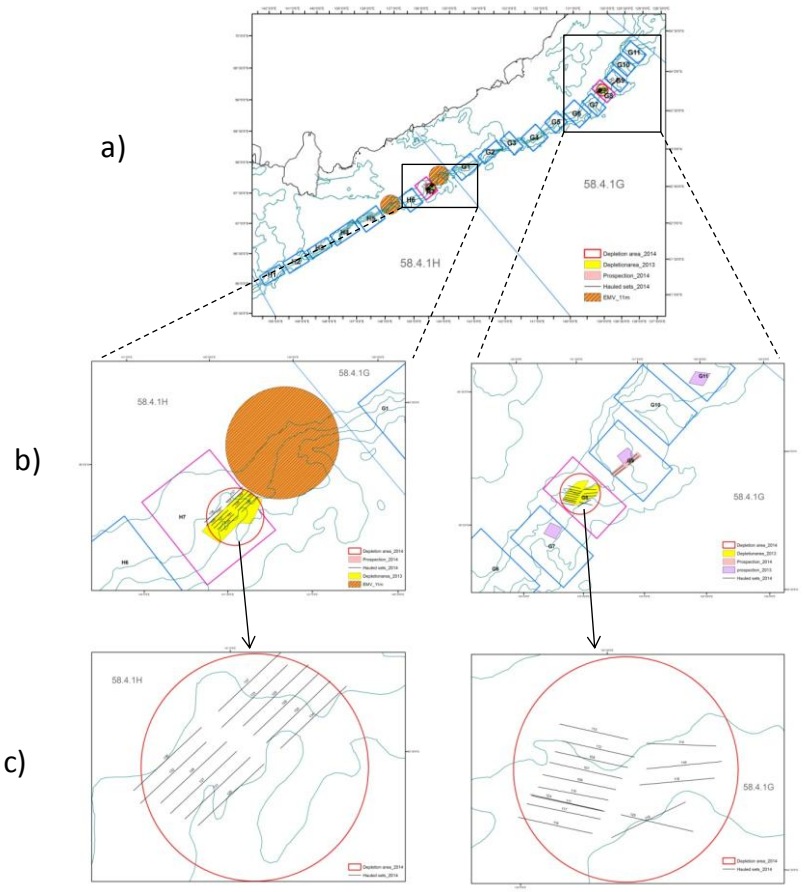


Figure 3. Design of the survey in the SSRUs 58.4.1G and H with the prospection blocks in 2013 and 2014 and the depletion blocks (a); depletion and prospection areas in 2013 and 2014 and sets hauled in 2014 (b); and detailed sequence of sets performed within the depletion area in 2014 (c).

The Spanish longline gear has been used during the whole research experience. Its configuration can be obtained from the "Preliminary risk assessment of the proposed bottom fishing activities in relation to potential severe damage of vulnerable marine ecosystems during the 2012-13 season" presented by Spain (CCAMLR, 2012-b). The main line of the set had 9321 m of length and rigging 4977 hooks, same in all the sets.

In order to finish the depletion already started in SSRU 58.4.1C once the 42 t (catch allocated by the Commission for the Spanish experience by SSRU) was about to be reached, but not the goal of the experiment, the CCAMLR Secretary and Japan were consulted regarding the situation. As Japan planned to visit this SSRU to conduct its own assessment experiment, permission to exceed the 42 t in detriment of Japanese catch limit was requested. Finally a small amount of extra catch have been used (6t) allowing to conduct the preliminary estimation of abundance. In the other SSRUs visited (58.4.1D, H, and G) the vessel has not reached the maximum catch limit assigned to Spain to perform the depletion experiment (CM 41-11, 2013) but in areas with greater densities of toothfish, the limit of 42 t seems to be insufficient to accomplish a single depletion experiment, being more realistic the first proposal made of 50 t (Sarralde *et al.*, 2012). The depletion was obtained at 48 t of retained catch.

Because the tagged toothfish were only measured, the estimation of tagged fish weight was derived from the above length-weight equation obtained from the samples on these four SSRUs by species, to obtain the total hauled catch (tagged and retained).

TOP: $y=2E\text{-}06x^{3.4383}$ $R^2 = 0.9349$ TOA: $y=5E\text{-}06x^{3.1761}$ $R^2 = 0.9686$

The total toothfish catch retained during the whole experience has been 101.59 t, mainly *D. mawsoni* (TOA) (Table 1). Only 51 individuals were *D. eleginoides* (TOP) from a total of 2845 individuals retained. Estimation of the total hauled catch has been 115.83 t, including the tagged fishes (522 TOA and 12 TOP).

Table 1. Number of sets completed by cluster, along with total *Dissostichus* spp. hauled catch, retained catch, observed catch rates (kg /1000 baited hooks), coefficient of variation (CV), mean soak time and mean weight of fish (Clusters where depletion occurred are highlighted in grey).

SSRU-Cluster	n sets	Total hauled catch	Total retained catch	Mean CPUE/ 1000 hooks	CPUE CV	Mean soak time (h)	Mean weight
58.4.1C-1	12	7556	6336	126,5	0,25	29,3	40,4
58.4.1C-2	21	55353	47813,5	529,6	0,85	32,3	40,3
58.4.1D-1	4	1758	1670,2	88,3	0,74	17,5	14,7
58.4.1D-2	4	931	897,1	47,0	0,71	37,1	23,6
58.4.1D-3	5	1579	1504,6	64,3	0,18	14,6	26,9
58.4.1D-4	6	1784	1650,2	59,7	0,95	16,9	22,0
58.4.1G-1	15	21385	18809,2	297,8	0,65	27,6	37,5
58.4.1G-2	4	6257	5540	314,3	0,60	24,1	38,7
58.4.1H-1	12	18327	16466,7	307,4	0,5	37,4	31,4

In Figure 4 is showed the detailed set sequence of the research by SSRU including the 2013 set sequence in red (c and d). The local areas where the depletion experiment were set are in the red circles and in rose the areas prospected.

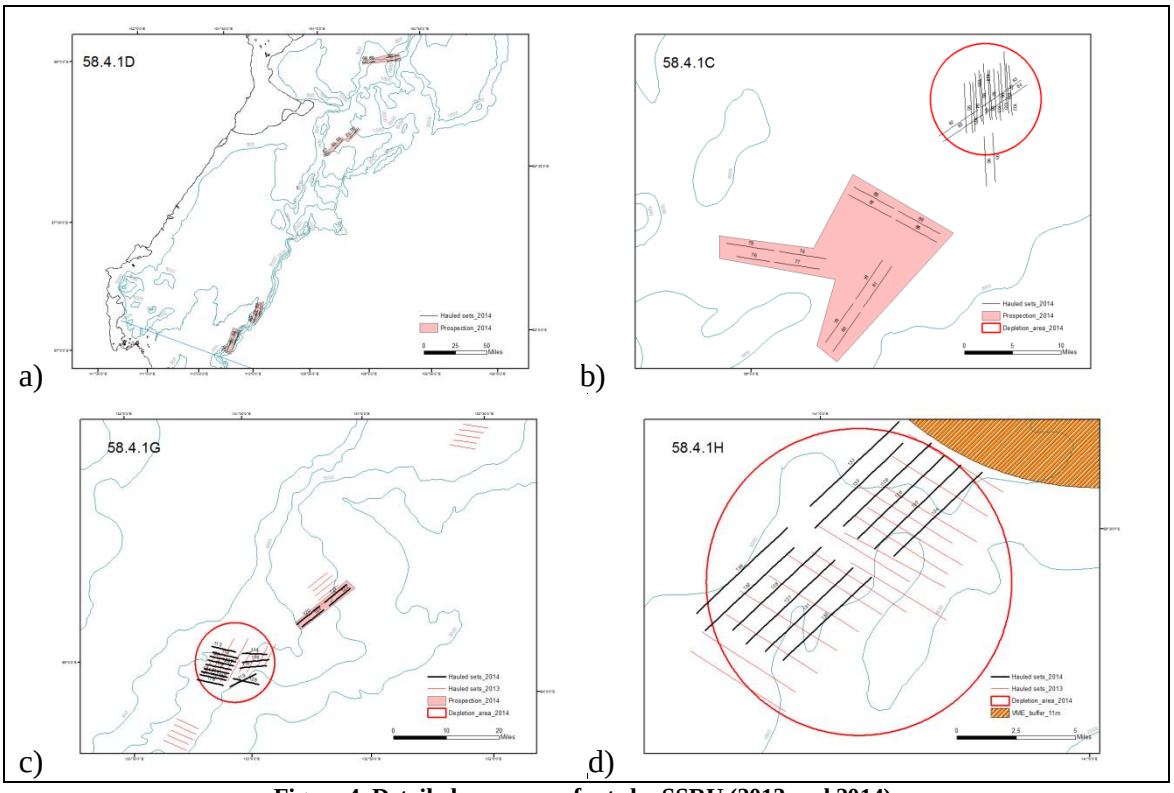


Figure 4. Detailed sequence of sets by SSRU (2013 and 2014).

The hauling is not sequential due to operational reasons and the distance between sets is about 1 nm.

Soak time

Looking at the soak time as a factor that could bias the results, there is not a clear correlation between CPUE and soak time (Figure 5). Some cluster of sets has a positive trend ie the longer the line is in the water the higher the CPUE, while other clusters showed the opposite trend.

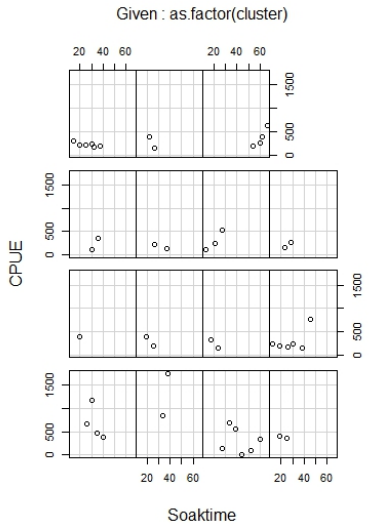


Figure 5. Soaktime (h) against CPUE (k/1000hooks) by set within the depletion circles and setting day.

Estimation of areas

New estimates of seabed areas for each ASDs and SSRUs have been made by the CCAMLR secretariat and can be found in the latest statistical bulletin. This database contains areas between 0 and 1800 meters depth (http://www.ccamlr.org/en/document/data/ccamlr-statistical-bulletin-vol-26).

In Table 2 is showed the Spanish fleet effort (number of sets) by depth strata and SSRU from 1997 to 2012, noting the presence of sets above 1800m, very few in the Ross Sea but some more in the other ASDs

Table 2. Spanish effort (n sets) by depth strata and SSRU from 1997 to 2012

SSRU	550-1800m	1800-2000m	2000-2300m	Total
483A	7			7
483B	1037	5	1	1043
483C	2520	25	5	2550
5841C	252	32	3	287
5841D	13			13
5841E	85	17	2	104
5841F	9		1	10
5841G	40			40
5841H	7			7
5842E	34	6	1	41
5843aA	285	5	1	291
5843bA	11			11
5843bB	128	70	9	207
5843bC	29			29
5843bD	21	4		25
5843bE	27			27
881B	36	4		40
881C	23	6	3	32
881H	129	1		130
881I	96	1	1	98
881J	2			2
881K	139			139
881L	4			4
882G	6			6
882H	42	1		43
Total	4982	177	27	5186

During the 2014 survey in Division 58.4.1 the maximum depth has been 1788 m, which is consistent with the 1800 m deeper limit calculate by the Secretariat (Table 3).

Table 3. Fishing depths by SSRU in the 2014 Spanish survey in Division 58.4.1 .

SSRU	Min Fishing depth (m)	Max Fishing depth (m)
58.4.1C	1555	1788
58.4.1D	566	1779
58.4.1G	953	1648
58.4.1H	1053	1450

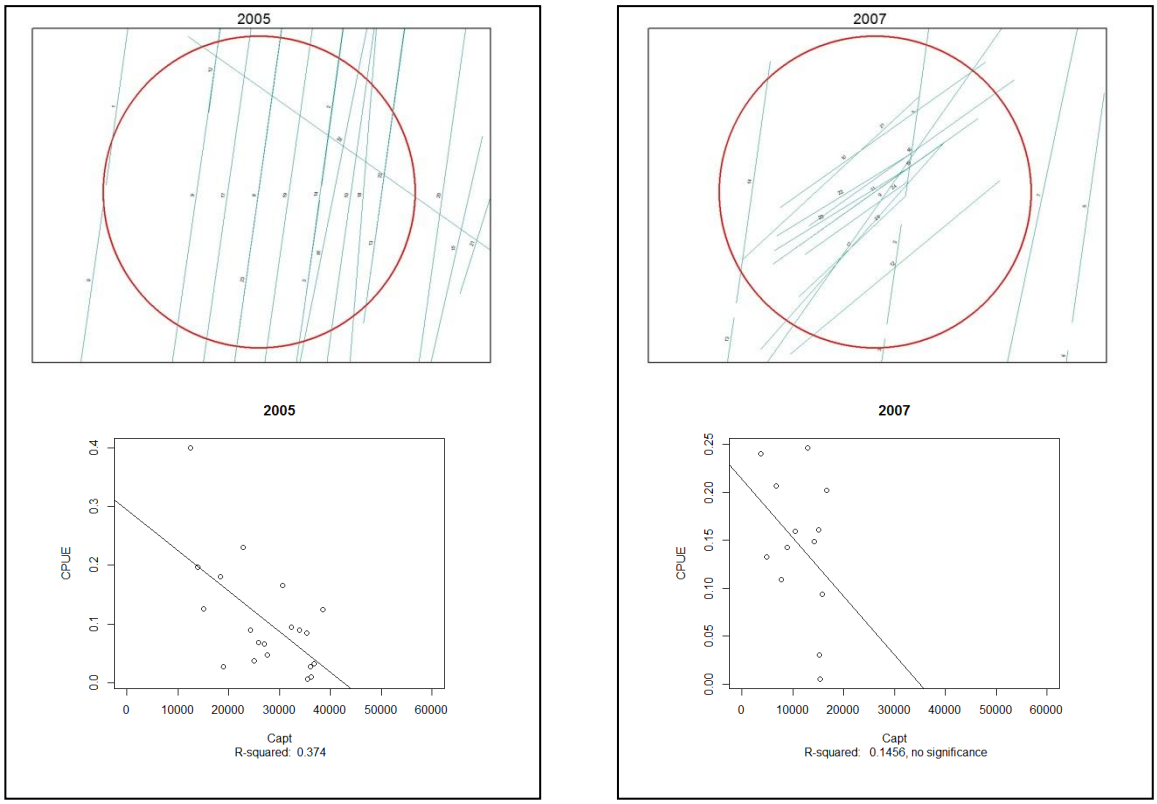
Local depletion experiments

Three depletion experiments have been performed during the 2014 survey, one in each SSRU 58.4.1H, G and C. In the SSRU 58.4.1D has never been reached the threshold to start the depletion which might be due to the potential low density or more likely to the existence of IUU fishing in the area.

The first depletion cluster took part in the SSRU 58.4.1C, where 21 sets were performed, two of which have not been used in the regression due to the separation to the others. It happened that the small area defined for the experiment is almost the same as the one historically fished by the Spanish fleet. Concurring with this circumstance, a historical revision of the Spanish fleet activity at this location has been made to find potential depletions made by the commercial vessels, similar to the study presented in Sarralde *et al*., 2012 for the Ross Sea.

During four previous seasons the fishing effort was concentrated in this area. Depletion tests have been made to estimate the local abundance. Figure 6 shows the results from the historical analysis, as well as the 2014 research experience.

It has been agreed from previous experiences that better results are expected in the regression analysis if we group the first exploratory sets (that were set consecutively), and start from their cumulative catch. All regressions have a negative slope but data from one of the seasons analyzed (2007) is not significant. The four remaining seasons, included the current survey, were significant (p-value < 0.05).



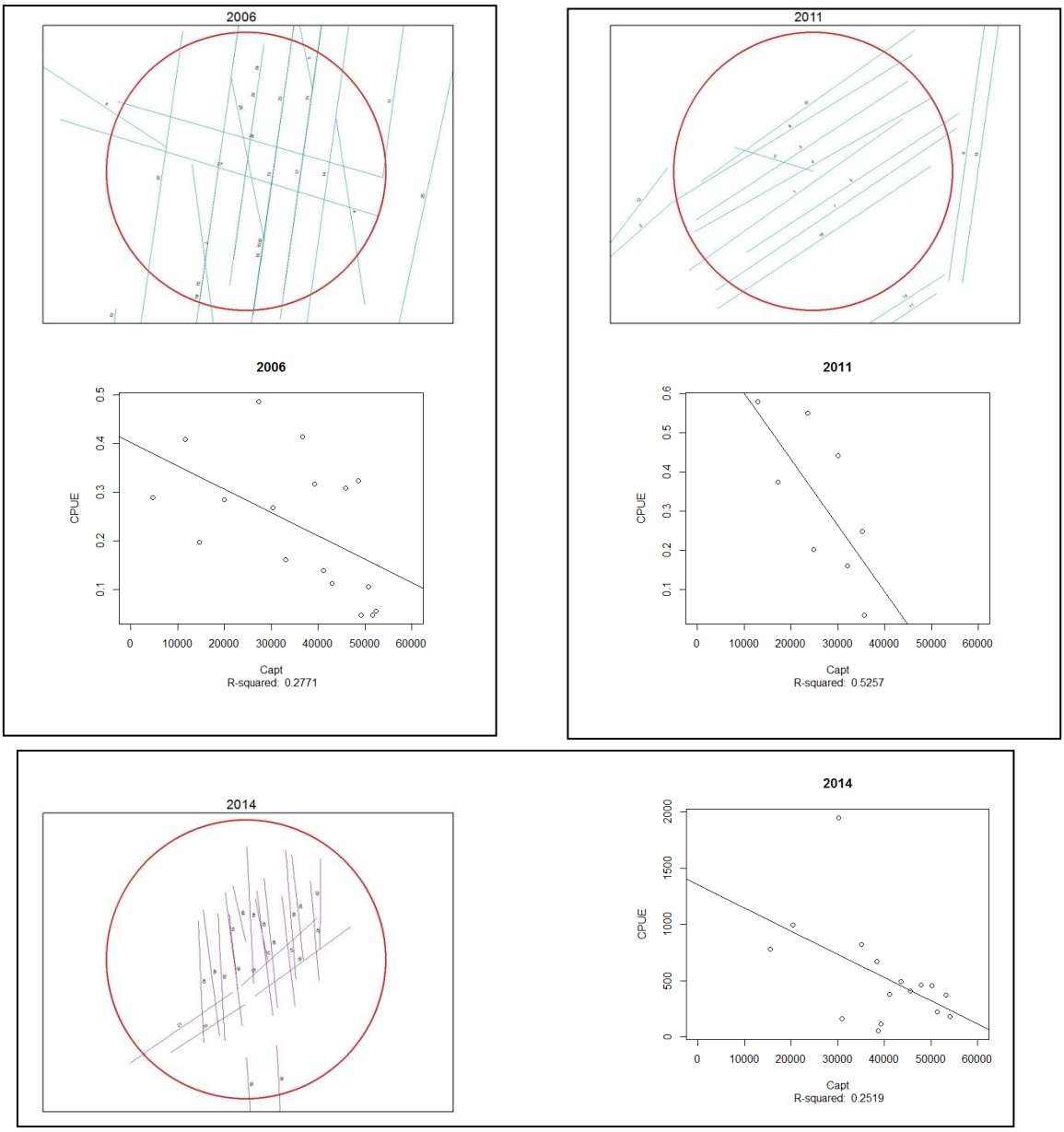


Figure 6. Depletion tests by season in the SSRU 58.4.1C. Depletion area (circle of 10nm ⌀) with the set sequence to the left and CPUE (kg/1000 hooks) against the cumulative catch (kg) by season to the right.

To obtain an estimate of uncertainty, 2000 bootstrap samples were taken from every depletion experience, allowing 95% confidence intervals to be derived from the resultant distribution of coefficients.

Results of the regression and bootstrap are showed in Table 4. Estimations of the local abundance vary from one season to the others in a double proportion from the lower (2005 season) to the higher (2006 season).

Table 4. B_{LOC} (kg) estimations within the same 10 nm ⌀ depletion circle in SSRU 58.4.1C.

Year	**B_{LOC}**	*95% confidence interval bootstrap*
2005	42518	(36149 , 80641)
2006	83779	(61057 , 193811)
2007	No significant	
2011	45523	(36734 , 81172)
2014	65433	(53196 , 112341)

A polygon including all sets used in the depletion analysis has been created (Figure 7, in green) and their area calculated using the ArcMap geometry calculator.

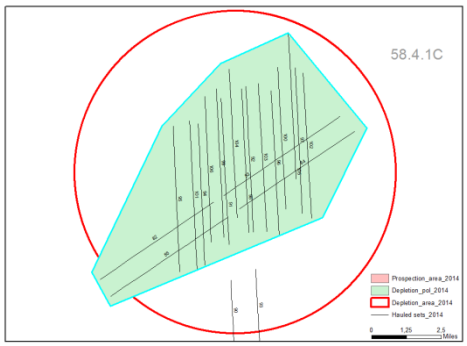


Figure 7. Depletion polygon area (in green) used to estimate the $B_{58.4.1C}$

Below is presented a preliminary estimation of the Total Biomass (t) in the SSRU 58.4.1C ($B_{58.4.1C}$) based on the total Seabed Area (600-1800m) by comparison with the results obtained from the regression analysis and the estimated area of the polygon during the depletion experiment.

SSRU	**Area polygon (km^2)**	**Area SSRU ($km^{2)}$**	**% prospected area**	**B_{LOC} (t)**	**$B_{58.4.1C}$ (t)**
58.4.1C	130,3	33959	0,38	65.433	**17053.26**

Unfortunately the two depletion experiences made in the SSRUs 58.4.1G and H didn't yield the expected results, according to the last season survey, even though the focused area has been the same. The linear regression of CPUE against cumulative catch in these two SSRUs had a positive slope. In these two areas the sea-ice condition and the initial low fish density have conditioned the work, together with the fuel constrictions that made impossible to continue fishing at those locations.

Sea-ice concentration

A daily monitoring of the sea-ice concentration was made based on the website AMSR-E/ASI Sea Ice Concentration Data hosted in the Bremen University (http://iup.physik.uni-bremen.de:8084/amsredata/asi_daygrid_swath/l1a/s6250/).

In Figure 8 is showed the Sea Ice concentration maps of the 58.4.1G y H SSRUs during three different days, from the beginning of the survey to the end. The ice cover made it impossible to prospect the SSRUs 58.4.1H and G at the start of the survey in mid-January. On the last week the ice extent was thinner and allowed to do some sets but not in shallower depths. The red circles represent the areas surveyed in all seasons and where the vessel focused its activities in order to recapture the maximum of tagged fishes, as well as to compare the depletion results.

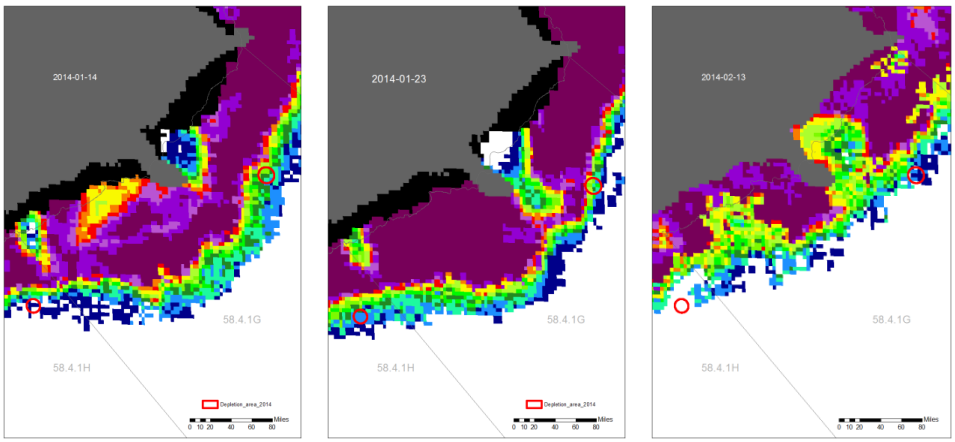


Figure 8. Sea ice concentration at the beginning, middle and end of the survey in SSRUs 58.4.1H and G. In red circles are the two experimental areas.

Tagging and recaptures

The toothfish tagging rate during the survey was five fish per ton caught. All fish tagged were selected randomly and in good condition. A total of 534 toothfish were tagged from which 522 were TOA and 12 TOP (11 from the 58.4.1G and 1 from the 58.4.1H SSRUs). The length-tag overlap statistics were about 73%.

During the experience, six individuals of tagged TOA have been recovered (Table 5), three of which occurred in SSRU 58.4.1C (two within-season recaptures and another recapture from a tagged toothfish by other vessel in 2011) and the remaining three in 58.4.1H (from the Spanish research survey conducted last season).

Twelve toothfishes from the 534 tagged were TOP, 11 within the 58.4.1 G and 1 in the 58.4.1 H SSRUs.

Table 5. Number of tags and recaptures of toothfish by year and SSRU

SSRU	release year	number of tags	within-season recaptures	Between-season recaptures
58.4.1C	2014	281	2	1(other vessel)
58.4.1D	2014	29	0	0
58.4.1G	2013	120	0	0
	2014	139	0	0
58.4.1H	2013	111	0	0
	2014	85	0	3

In Figure 9 is detailed the location and trajectory of the three tagged individuals in the 8.4.1H SSRU. The movement is lower than 2 nm in all cases.

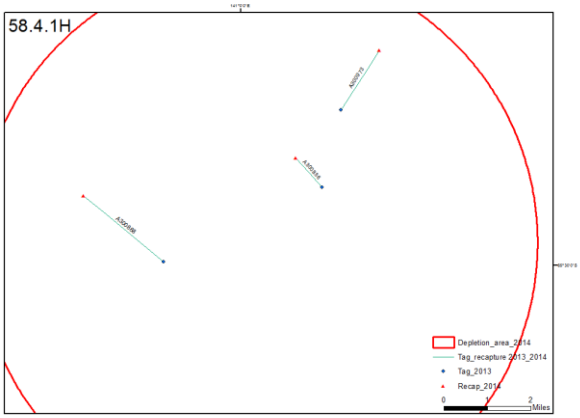


Figure 9. Location and trajectory of the TOA recaptured in 58.4.1H.

Fish bycatch

The most common bycatch species were grenadiers (*Macrourus* spp.) comprising about 5.3% of the catch by weight but more than 60% of the catch by number (Table 6). Other bycatch especies amount less than 0.12% of the catch by weight. In terms of numbers the moray cods *Muraenolepis* spp (MRL) and the striped-eyed rockcod *Notothenia kempi* (NOK) represent the 1.5 and 1.4% of the bycatch by number respectively.

Table 6. Total hauled catch/bycatch and numbers (including tagged fish), weight and number hauled and proportions of catch by weight and number by species*.

Species	Catch kg	Catch n	Hauled kg	Hauled n	Proportion w	Proportion n
TOA	100640	2848	114930	3370	93.73	33.63
TOP	678	51	902	63	0.74	0.63
GRV	6483	6047	6483	6047	5.29	60.35
MRL	134	147	134	147	0.11	1.47
NOK	70	136	70	136	0.06	1.36
CHW	52	88	52	88	0.04	0.88
FIC	20	109	20	109	0.02	1.09
POG	11	27	11	27	0.01	0.27
TRT	8	30	8	30	0.01	0.30
ANT	6	3	6	3	0.01	0.03

*TOA: *Dissostichus mawsoni*; TOP: *Dissostichus eleginoides*; GRV: *Macrourus* spp.; MRL: *Muraenolepis* spp; NOK: *Notothenia kempi*; CHW: *Chionobathyscus dewitti*; FIC: *Cryodraco antarcticus*; POG: *Pogonophryne* spp.; TRT: *Trematomus* spp, ANT: *Antimora rostrata*

Vulnerable marine ecosystem indicator taxa

Monitoring on VME taxa by-catch according to CM 22-06 and 22-07 showed no segments exceeded the 5 kg reporting threshold. Differences in taxa found by SSRU (Table 7) indicate the prevalence of phylum Porifera (PFR +HXY) in the SSRU 58.4.1H (95% - weight) while this phylum amount less than 20% of the by-catch in kg in the others SSRUs. The most abundant taxa in SSRU 58.4.1G were Cnidarian from the Order Actiniaria (ATX) (78%).

In the SSRU 58.4.1D also Actiniarians are the order most abundant (55%) while in the SSRU 58.4.1C the presence of VME taxa has been very scarce, both in weight and number.

Table 7. Number, weight (kg) and % of presence by set and SSRU of VME taxa*.

	58.4.1.C			58.4.1.D			58.4.1.G			58.4.1.H		
Taxa	n	w	% presence	n	w	% presence	n	w	% presence	n	w	% presence
AJZ	1	0.05	3.03	0	0	0.00	0	0	0	0	0	0
ATX	0	0.00	0.00	49	2.4	10.53	8	2.05	26.3	2	0.4	16.7
CWD	0	0.00	0.00	2	0.03	5.26	0	0	0	0	0	0
GGW	0	0.00	0.00	12	0.59	31.58	0	0	0	2	0.12	8.33
HXY	0	0.00	0.00	0	0	0.00	0	0	0	1	0.1	8.33
NTW	1	0.10	3.03	4	0.45	15.79	1	0.08	5.26	1	0.1	8.33
PFR	0	0.00	0.00	1	0.5	5.26	1	0.5	5.26	46	17.3	58.3
SSX	0	0.00	0.00	5	0.12	5.26	0	0	0	1	0.2	8.33
ZOT	0	0.00	0.00	3	0.25	5.26	0	0	0	0	0	0

*AJZ: Alcyonacea; ATX: Actiniaria; CWD:Stalked crinoids; GGW: Gorgonacea; HXY: Hexactinellida; NTW: Pennatulacea; PFR: Porifera; SSX: Ascidiacea; ZOT: Zoantharia

The spatial distribution of the VME taxa in the catches is presented in Figure 10. The figure of the SSRU 58.4.1H shows the buffer area protected by the CM 22-09 (Annex A).

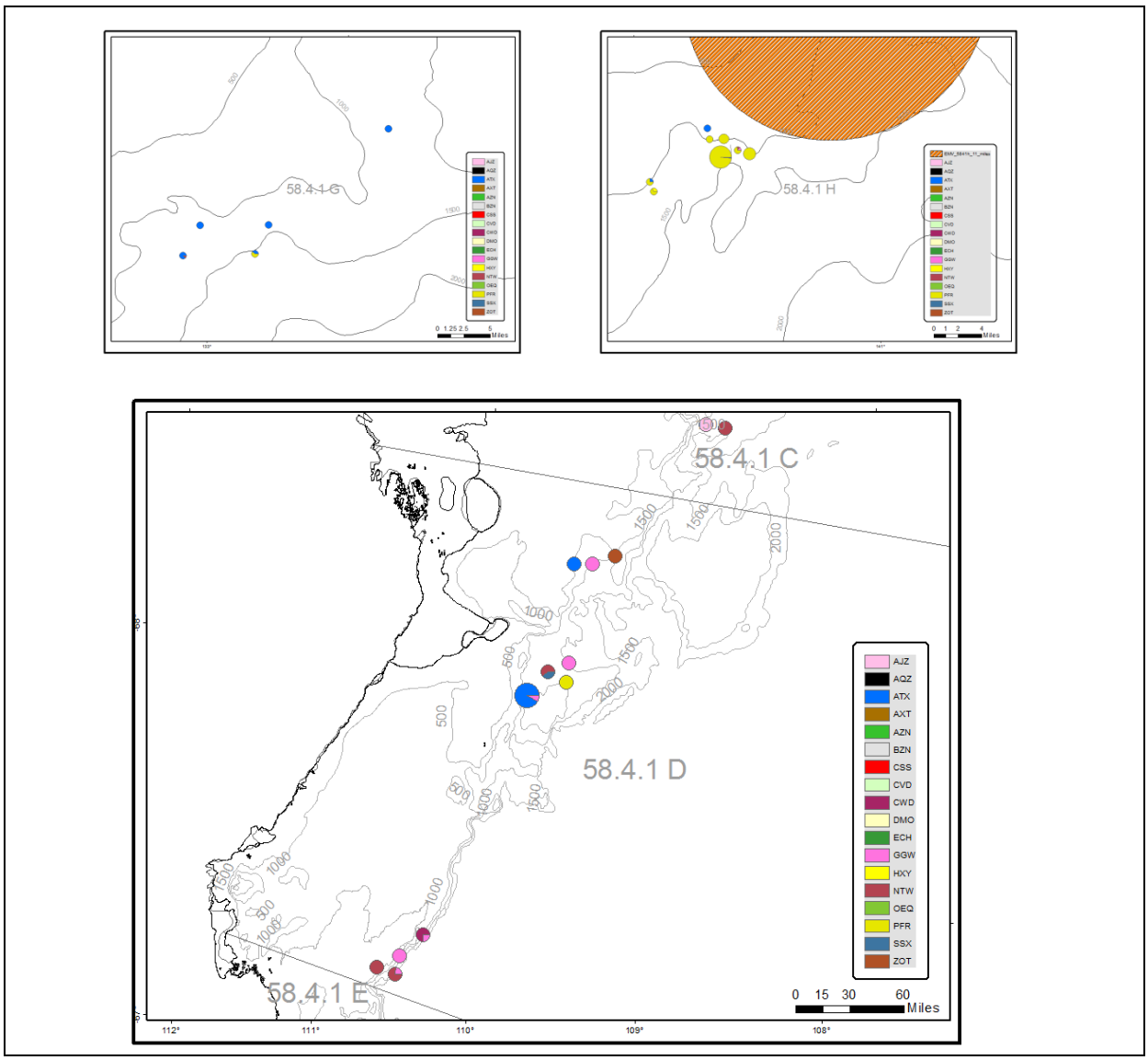


Figure 10. VME taxa indicator distribution by SSRU.

The maximum amount (kg) in an entire set has been 12.4kg of VME taxa in SSRU 58.4.1H (Porifera) and 2.2kg in SSRU 58.4.1D (Actiniaria). When the by-catch of these two lines is split in segments we notice that the maximum catch in a segment in SSRU 58.4.1H was 3.7 kg and 1.4 kg of Actiniarians in SSRU 58.4.1D (Table 8).

Table 8. Maximum catch sets by segment and VME taxa.

Set number	Segment number	Taxa	Weight (k)
67	6	ATX	1.4
	8	ATX	0.8
	8	GGW	0.2
126	1	PFR	3.5
	2	PFR	3.2
	3	PFR	3.7
	5	PFR	2
	5	SSX	0.2

TENTATIVE EXPERIENCE SCHEDULE

A tentative work schedule is proposed below. Depending on available data it is intended to start a robust stock assessment in 2017/18.

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Estimation of local abundance in SSRUs with Leslie's depletion method.						
58.4.1H	X	X	X			
58.4.1G	X	X	X			
58.4.1D		X	X	X		
58.4.1C		X	X	X		
58.4.1B				X	X	X
58.4.2E				X	X	X
Estimation of local abundance in SSRUs with Petersen's simple estimator (tag/recapture data)						
58.4.1H				X	X	X
58.4.1G				X	X	X
58.4.1D					X	X
58.4.1C					X	X
58.4.1B						X
58.4.2E						X
D.mawsoni age estimation of otoliths. Length-age keys						
58.4.1H				X		
58.4.1G				X		
58.4.1D				X		
58.4.1C				X		
58.4.1B						X
58.4.2E						X

FRAMEWORK FOR WHICH THE DATA COLLECTED CAN BE DEVELOPED INTO A STOCK ASSESSMENT

Estimates of local abundance are being calculated from the depletion experiment and also compared with local estimates from commercial fishing activity at different periods. In this second year some tagged toothfish have been recaptured, so it is expected to start to estimate the local abundance from tag-recapture data using the simple Petersen method. From the prospecting phase of the experience we could derive areas with low, medium and high density. Thus, the best the prospection phase, covering the maximum of fishing depth strata, the better estimates of partial abundance and SSRU Stock Biomass, but the main problem which is facing is the need of concentrate fishing in areas to be depleted against the need of spread the areas to be studied and the integration of areas with low fish density in the whole approach.

These two different approaches to estimate the Stock Biomass envisaged is recommended by the SC-CCAMLR, 2013. As it has been agreed, the spatial distribution of effort is consistent between years revisiting the same areas surveyed during the depletion experiments from at least the two/three following years, so as far as the survey progress it is expected to improve these estimates.

During this year the IEO has started the age determination of TOA using otoliths. This work, especially for regions with data-limited fisheries, is a priority in order to input catch at age data into the expected assessment. A total of 1985 otoliths from the last two surveys in the 58.4.1 division are available at the laboratory, 1089 females and 896 males.
The length distribution of individuals of collected otoliths by sex for ageing purposes is in Figure 11.

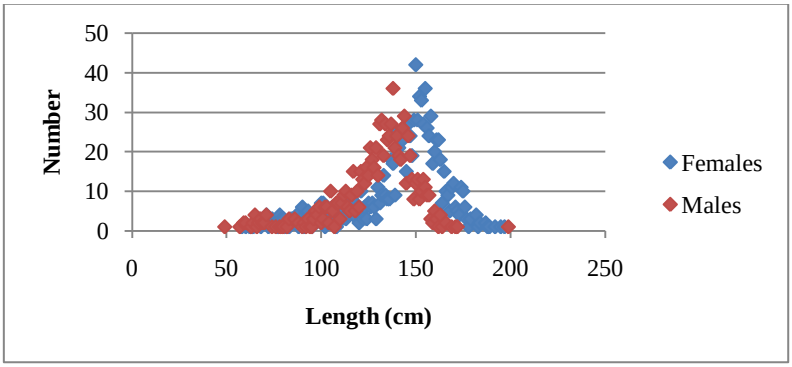


Figure 11. Length distribution of TOA specimens of otoliths obtained in the 58.4.1 division.

CONCLUSIONS

This experience is conceived as a multi-year proposal, so it is expected that every year new data will be available to better understand the toothfish dynamic in Divisions 58.4.1 (up to now) and 58.4.2. This has been the second year already implemented, and despite some difficulties as the ice-condition, results are highly promising.

The prospection pattern has been adapted from year to year to the circumstances and learning and opened to the WG-CCAMLR and SC-CCAMLR suggestions but as usual in the at-sea work, unpredictable situations happened that needed a quick response. The IEO team and the observers on board have been in permanent contact during the survey to try to solve these problems, mainly:

- ✓ The 42t of retained toothfish allowable by SSRU seem to be low and could jeopardize the experience in areas with higher densities.
- ✓ The presence of IUU fishing vessels in some areas.
- ✓ The sea ice concentration is highly variable from one season to other and movements of pack-ice due to strong winds
- ✓ As long as the prospection progress and more SSRUs are visited the fuel consumption could be a weak point.

The IUU fishing is highly problematic. The extent of this fishing in the SSRU 58.4.1D is unknown but presumably high. This year the presence of our vessel forced a IUU vessel to flee from the area.

With respect to recaptures, there have been TOA recaptured within-season in the SSRU 58.4.1C which has a higher toothfish densities than the other SSRU surveyed, but not in the remaining SSRUs. Also there have been recaptures in the 58.4.1H SSRU but no one in the 58.4.1G although it has been more surveyed although with difficulties due to ice.
Depending on the next year results, it is expected to estimate the toothfish abundance in SSRU 58.4.1G and H using the modified Lincoln- Petersen method by the end of the next 2014/15 season.

The estimation of the local biomass has only been possible in the SSRU 58.4.1C, where we have obtained a good data that has allowed us to compare with other seasons commercial catch.

The use of historical commercial fishing data are made as a reference to the data obtained from the research surveys. Results between years and between those commercial and the research survey don't differ much.

This is a preliminary result and updates are expected as soon as new data are available. At the 2014 WG-FSA is intended to present a report with the results of the two implemented surveys.

To develop an understanding of the relative density of toothfish over the whole fishable area within a SSRU is expected.

The availability of seabed area estimates made by the Secretariat is highly valuable. To extend the range of data beyond 1800 m deep could be interesting, at least in the ASD where there are deeper fishable depths.

Coordination with other members fishing in the same SSRUs is an important issue.

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